

FORM PTO-1399 (REV 5-93)		U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE		ATTORNEY'S DOCKET NUMBER 3446 US
TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371				PCT U.S. APPLICATION NO. (PCT/IB/308) 31 09/308314
INTERNATIONAL APPLICATION NO. PCT/EP97/05478		INTERNATIONAL FILING DATE October 6, 1997		PRIORITY DATE CLAIMED November 14, 1996
TITLE OF INVENTION SHIELD CLEANING SYSTEM, OPERATING SOLELY BY SPRAYING WITH WASHING FLUID				
APPLICANT(S) FOR DO/EO/US Joachim BANDEMER, et al				
Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information				
<ol style="list-style-type: none">1. <input checked="" type="checkbox"/> This is a FIRST submission of items concerning a filing under 35 U.S.C. 371.2. <input type="checkbox"/> This is a SECOND or SUBSEQUENT submission of items concerning a filing under 35 U.S.C. 3713. <input checked="" type="checkbox"/> This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1) (PTC 401)4. <input checked="" type="checkbox"/> A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date5. <input checked="" type="checkbox"/> A copy of the International Application as filed (35 U.S.C. 371(c)(2))<ol style="list-style-type: none">a. <input type="checkbox"/> is transmitted herewith (required only if not transmitted by the International Bureau)b. <input checked="" type="checkbox"/> has been transmitted by the International Bureau (PCT/IB/308)c. <input type="checkbox"/> is not required, as the application was filed in the United States Receiving Office (RO/US)6. <input checked="" type="checkbox"/> A translation of the International Application into English (35 U.S.C. 371(c)(2)). - 18 pages with Abstract7. <input type="checkbox"/> Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))<ol style="list-style-type: none">a. <input type="checkbox"/> are transmitted herewith (required only if not transmitted by the International Bureau).b. <input type="checkbox"/> have been transmitted by the International Bureau.c. <input type="checkbox"/> have not been made, however, the time limit for making such amendments has NOT expiredd. <input type="checkbox"/> have not been made and will not be made.8. <input type="checkbox"/> A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).9. <input checked="" type="checkbox"/> An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)). (2 pages)10. <input type="checkbox"/> A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).				
Items 11. to 16. below concern other document(s) or information included:				
<ol style="list-style-type: none">11. <input checked="" type="checkbox"/> An Information Disclosure Statement under 37 CFR 1.97 and 1.98, and 1 PTO-1449 and 3 pages of International Search Report (European Searching authority).12. <input type="checkbox"/> An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included13. <input checked="" type="checkbox"/> A FIRST preliminary amendment. <u>ENTER PRELIMINARY AMENDMENT BEFORE CALCULATING CLAIM FEES</u> <input type="checkbox"/> A SECOND or SUBSEQUENT preliminary amendment.14. <input type="checkbox"/> A substitute specification.15. <input type="checkbox"/> A change of power of attorney and/or address letter.16. <input checked="" type="checkbox"/> Other items or information: WO 98/21076 (cover page)				
17. X PCT ... 401				
18. X PCT/IB/308				
19. X CLAIM IS HEREBY MADE OF THE BENEFIT OF THE FILING DATE OF GERMAN PATENT APPLICATION 196 46 972.4 FILED November 14, 1996 UNDER 35 USC 119				
20. X EXPRESS MAIL MAILING LABEL EI750168161US deposited May 13, 1999 Mailing label no. on all papers				

U.S. APPLICATION NO. <u>12402</u> (Rev. 37 CFR 1.31)		INTERNATIONAL APPLICATION NO. PCT/EP97/05478		ATTORNEY'S EXAMPT. NO. WITH 3446 US	
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17. ☒ The following fees are submitted:

Basic National Fee (37 CFR 1.492(a)(1)-(5)):

Search Report has been prepared by the EPO or JPO..... \$840.00

International preliminary examination fee paid to USPTO (37 CFR 1.482)
..... \$640.00

No international preliminary examination fee paid to USPTO (37 CFR 1.482)
but international search fee paid to USPTO (37 CFR 1.445(a)(2)).. \$710.00

Neither international preliminary examination fee (37 CFR 1.482) nor
international search fee (37 CFR 1.445(a)(2)) paid to USPTO..... \$950.00

International preliminary examination fee paid to USPTO (37 CFR 1.482)
and all claims satisfied provisions of PCT Article 33(2)-(4)..... \$90.00

ENTER APPROPRIATE BASIC FEE AMOUNT =

Surcharge of \$130.00 for furnishing the oath or declaration later than ☐ 20 ☐ 30
months from the earliest claimed priority date (37 CFR 1.492(e)).

Claims	Number Filed	Number Extra	Rate		
Total Claims	27	-20 =	7	X \$180.00	\$ 126.00
Independent Claims	1	-3 =	0	X \$74.00	\$ 0
Multiple dependent claims(s) (if applicable) *				+ \$230.00	\$ 0
TOTAL OF ABOVE CALCULATIONS =					\$ 966.00
Reduction by 1/2 for filing by small entity, if applicable. Verified Small Entity statement must also be filed. (Note 37 CFR 1.9, 1.27, 1.28).					\$
SUBTOTAL =					\$ 966.00
Processing fee of \$130.00 for furnishing the English translation later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(f)).					\$ 0
TOTAL NATIONAL FEE =					\$ 966.00
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property +					\$
TOTAL FEES ENCLOSED =					\$ 966.00
					Amount to be:
					refunded \$
					charged \$

<p>no. 12402</p> <p>a. <input checked="" type="checkbox"/> A check in the amount of \$ <u>966.00</u> to cover the above fees is enclosed.</p> <p>b. <input type="checkbox"/> Please charge my Deposit Account No. _____ in the amount of \$ _____ to cover the above fees. A duplicate copy of this sheet is enclosed.</p> <p>c. <input checked="" type="checkbox"/> The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. <u>06-0105</u>. A duplicate copy of this sheet is enclosed.</p> <p>NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.</p> <p style="text-align: center;">* PLEASE ENTER PRELIMINARY AMENDMENT BEFORE CALCULATING CLAIM FEES</p>	<p style="text-align: center;">SIGNATURE</p> <p style="text-align: center;"><u>MARTIN A. FARBER</u></p> <hr/> <p style="text-align: center;">NAME</p> <p style="text-align: center;">REG. NO. 22,345</p> <hr/> <p style="text-align: center;">REGISTRATION NUMBER</p>
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09/308314

510 Rec'd PCT/PTO 13 MAY 1999

3446 US

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Express Mail mailing label No. EI750168161US
Deposited May 13, 1999

USA National Stage Patent Application
PCT/EP97/05478 filed October 6, 1997
Joachim Bandemer, et al
SHIELD CLEANING SYSTEM, OPERATING SOLELY BY SPRAYING
WITH WASHING FLUID

Priority: German Patent Application
196 46 972.4 filed November 14, 1996

Hon. Commissioner of Patents and Trademarks
Washington, D.C. 20231

S I R :

PRELIMINARY AMENDMENT

Please amend this application simultaneously with filing as
follows:

IN THE ABSTRACT

(unnumbered Page 18)

Line 21 (bottom line on page), delete "(Figure 2)"

IN THE SPECIFICATION

Page 1, Line 5, delete "Description"

Line 10, before this line, after the title, insert:

--FIELD AND BACKGROUND OF THE INVENTION--

Page 2, Line 21, before this line insert:

--SUMMARY OF THE INVENTION--

Lines 21 and 27, change "problem" (both occurrences) to
--object--

Line 22, change "design" to --provide--

Line 28, change "designed" to --provided--

Page 9, Line 11, before this line insert:

--BRIEF DESCRIPTION OF THE DRAWINGS--

Page 10, Line 4, before this line insert:

--DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS--

IN THE CLAIMS

(APPLICATION PAGES 14-17)

before claim 1, change "Patent claims" to --WE CLAIM:--

(The following lines refer to the lines of each claim)

Claim 1, Line 15, change "designed" to --formed--

Claim 3, Line 2, delete "or 2"

Line 3, change "design" to --form--

Claims 5 and 6, Lines 1-2, change "at... claims" (both occurrences) to --claim 3--

Claims 7-14, 16, and 18, Lines 1-2, change "at... claims" (all occurrences) to --claim 1--

Claim 17, Lines 1-2, change "at ... claims" to --claim 13--

Claim 22, Line 2, change "designed" to --formed--

Claim 23, (the second, incorrectly numbered Claim 23),
renumber this claim to be claim --24.--

Claim 24, renumber this claim to be claim --25.--, and
Lines 1-2, change "at ... claims" to --claim 1--

Claim 25, renumber this claim to be claim --26.--, and
Lines 1-2, change "at ... claims" to --claim 1--

Claim 26, renumber this claim to be claim --27.--, and
Lines 1-2, change "at ... claims" to --claim 1--

R E M A R K S

The Abstract, specification and claims have been amended in


accordance with USA practice.

This amendment is being made simultaneously with filing this application so that no multi-dependent claims exist as of the filing date.

Please enter this amendment prior to calculating the claim filing fee.

Respectfully submitted,

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09/308314

TRANSLATION OF PCT/EP97/05478

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3446 PCT

~~510 PCT/EP~~ 13 MAY 1999

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Description

Shield cleaning system, operating solely by spraying
with washing fluid

10 The invention relates to a shield cleaning
system, operating solely by spraying with washing
fluid, for shields of an automobile, in particular for
shields of automobile lights, with a washing arm
movable over and at a distance from the shield by a
15 motor and with a washing nozzle which is arranged on
the washing arm and which is provided for spraying
washing fluid onto the shield.

 In a known shield cleaning system, the washing
nozzle is moved by the washing arm from a position of
rest next to the shield into an operating position in a
20 central position above the shield. The shield cleaning
system is thereby essentially independent of the
external design of the automobile. However, since the
washing nozzle also has to clean the edge regions of
25 the shield from the central position above the latter,
in the operating position the washing nozzle is at a
long distance from the shield. The washing fluid jet
may consequently be deflected by the relative wind. In
order to clean the shield, therefore, the known shield
30 cleaning system requires particularly high pressure at
the washing nozzle and a large quantity of washing
fluid. The known shield cleaning system therefore has a
very high-powered washing fluid pump and a washing
fluid container of large volume. This leads, however,
35 to a high outlay in terms of construction and to high
production costs of the shield cleaning system.

Furthermore, a washing nozzle has become known,
which has a swirl chamber with an axial and a
tangential inlet. A conical and a central washing fluid

jet can thereby be generated alternately. The dirt adhering to the shield is consequently flushed from inside outward to the shield edge, as a result of which a particularly good cleaning action is to be achieved.

5 Since, in this case too, the washing nozzle is located in a central position above the shield, a very high pressure at the washing nozzle and a large quantity of washing fluid are also required in this design, particularly in order to clean the edge regions of the

10 screen.

It would be conceivable to improve the cleaning action by means of a shield wiper which wipes away the dirt released by the washing fluid. This is not possible, however, particularly with regard to

15 automobile light shields produced from transparent plastic, since they may be scratched by the screen wiper. In future automobiles, for example, video cameras could well also be used, the shields of which would likewise have to be protected from being

20 scratched by a screen wiper.

The problem on which the invention is based is to design a shield cleaning system of the initially mentioned type, in such a way that, with a particularly small quantity of washing fluid, it cleans the shield

25 thoroughly and without the risk of the shield being scratched.

This problem is solved, according to the invention, in that the washing nozzle is designed for spraying a part region of the shield and can be moved

30 by the washing arm over that region of the shield which is to be cleaned.

Since the washing nozzle of the shield cleaning system according to the invention sprays only a part region of the shield with washing fluid, said washing

35 nozzle may be arranged at a substantially shorter distance above the shield than the washing nozzle of the known shield cleaning system. Since the washing nozzle is at a short distance from the shield, the washing fluid jet is deflected only insignificantly by

the relative wind. As a result, dirt adhering to the shield is flushed away according to the movement of the washing arm, so that the shield is cleaned particularly thoroughly. Moreover, only a particularly small washing
5 fluid pump and a very small washing fluid container are required, since losses of washing fluid are kept particularly low due to the short distance of the washing nozzle from the shield. The shield cleaning system according to the invention can therefore be
10 produced particularly cost-effectively and has particularly low washing fluid consumption. Furthermore, scratching of the shield is ruled out because it is cleaned solely by the washing fluid jet. Shields of any size can be cleaned by arranging a
15 plurality of washing nozzles which overlap slightly in the spray region.

According to an advantageous development of the invention, the shield cleaning system according to the invention has a particularly high cleaning action,
20 along with a particularly low washing fluid consumption, if the washing nozzle is designed as a fluidic nozzle with a washing fluid jet oscillating essentially transversely to the direction of movement of the washing arm. Even if the pressure in the washing
25 fluid line is relatively low, such fluidic nozzles generate a sharp punctiform washing fluid jet which constantly oscillates laterally through an intended angle. As a result, the washing nozzle has a striplike or elliptic spray region. The washing fluid jet is
30 guided over the entire shield by means of the movement of the washing nozzle by the washing arm.

According to another advantageous development of the invention, the washing arm is particularly simple in terms of construction if it is of tubular
35 design for receiving a washing fluid duct leading to a plurality of washing nozzles and has a connection for a washing fluid line.

If there is a plurality of washing nozzles connected to a common washing fluid duct, all the

washing nozzles receive the same quantity of washing fluid if, according to another advantageous development of the invention, the washing fluid duct has a tapering inner contour, as seen from the connection of the washing fluid line.

According to another advantageous development of the invention, washing fluid is constantly present in the vicinity of the washing nozzles if a nonreturn valve is arranged in the washing fluid duct. This design keeps a delay in cleaning the shield after the shield cleaning system has been switched on particularly short.

According to another advantageous development of the invention, the washing nozzles can be prevented in a simple way from freezing up if a heating element is arranged in the washing fluid duct and/or at the washing nozzles.

According to another advantageous development of the invention, the shield cleaning system can be produced particularly cost-effectively if the washing arm is mounted pivotably about a pivot axis.

In known shield cleaning systems irregularly shaped screens can be cleaned only partially, since, in this case, the washing nozzle sprays the edges of the shields only inadequately with washing fluid. However, according to another advantageous development of the invention, shields of irregular shape are cleaned virtually completely if they have means for adjusting the distance of the washing nozzle from the shield during the movement of said washing nozzle. By virtue of this design, the washing nozzle is at a particularly long distance from the shield when a wide region of the shield is to be sprayed. Since the spray region, of fluidic nozzles in particular, widens with an increasing distance from the washing nozzle, the shield is reliably cleaned as far as and into its edge regions.

According to another advantageous development of the invention, the means for increasing the distance

of the washing nozzle from the shield are particularly simple in terms of construction if the washing arm has a yoke mounted pivotably in a lateral region of the shield and, when in the basic position, at least partially surrounding the shield.

According to another advantageous development of the invention, the washing arm is particularly stable if it has a yoke mounted on two opposite sides of the shield. By virtue of this design, for example, round or elliptic shields can be cleaned in a particularly simple way, since, in this case, the distance of the washing nozzle from the shield and, consequently, the width of the sprayed region change uniformly with the pivot angle of the washing arm. Oval shields are cleaned completely by means of a plurality of washing nozzles arranged next to one another, without washing fluid being sprayed alongside the shield.

According to another advantageous development of the invention, the washing nozzle always sprays perpendicularly onto the shield if the washing arm has two yokes running parallel and the washing nozzle is mounted pivotably relative to each of the yokes.

According to an advantageous development of the invention, a lateral boundary of the spray region of the washing nozzle moved at a variable distance over the shield can be set in a simple way if the washing nozzle is inclined transversely to its direction of movement.

Particularly in the case of convexly curved shields of automobile lights, the intended distance of the washing nozzles from the shield can often be maintained by means of the pivotably mounted washing arm. According to another advantageous development of the invention, even in the case of convexly curved shields, the washing nozzles are at the intended distance from the shield if the washing arm has a push rod mounted so as to be longitudinally displaceable and shaped according to the contour of the shield.

According to another advantageous development of the invention, the washing nozzles are reliably protected from damage if, in a basic position, the washing nozzles are countersunk in a recess of an automobile component adjacent to the shield.

According to another advantageous development of the invention, soiling of the washing nozzles countersunk in the recess can be reliably avoided if the washing arm has a cover closing the recess in the basic position. Furthermore, by virtue of this design, the shield cleaning system has virtually no influence on the automobile's air resistance. For visual reasons, the cover may be lacquered in the color of the automobile component adjacent to the shield.

According to another advantageous development, the washing arm can be produced particularly cost-effectively if it is produced from plastic by the injection molding method. If the washing arm has a cover for the recess, the cover may, for example, be colored in the color of the automobile component adjacent to the shield.

The shield cleaning system according to the invention is fitted in a particularly simple way if a guide of the push rod or a mounting of the washing arm is produced in one piece with a housing of the automobile light.

Experience has shown that shield cleaning systems have a considerable influence on the visual appearance of the automobile. A particular advantage due to the fact that a washing arm is visible only during the cleaning operation is afforded if the washing arm is designed as a component shaped according to the contour of a body element and is arranged so as to be movable out of said body element. This body element is expediently located in a region directly in front of the shield.

A high proportion of already prefabricated and preassembled components is particularly profitable in automobile production. A particular embodiment of the

shield cleaning system according to the invention can be fitted by a supplier, independently of the automobile, if the body element is a fender of an automobile.

5 Conventional shield cleaning systems often have the disadvantage that, in order to be used, they first have to be moved into an operating position and only thereafter can the actual washing operation commence. The washing arm is already in a position for operation
10 if, according to a further embodiment according to the invention, the washing nozzle is arranged on the top side of the component.

 A shield cleaning system of the type mentioned should operate reliably precisely under adverse
15 environmental conditions. In the case of washing arms of the conventional type which are exposed, the washing nozzle may be covered, for example, with a layer of snow in winter, thereby considerably restricting the action of such washing nozzle arrangements. The shield
20 cleaning system is largely protected against environmental influences if the washing nozzle is arranged on the underside of the component. In this version, the washing nozzle, when in the position of rest, remains inside the body elements surrounding it
25 and is therefore visible only in the operating position.

 The shield cleaning system according to the invention can be produced particularly economically if the fitting outlay is diminished by a reduction in the
30 components. A corresponding embodiment, in which the component is designed in one piece with the washing nozzle, can be achieved if the component is designed as a washing nozzle.

 The component according to the invention,
35 movable out of the contour of a body element, opposes little resistance to the air flow, even at high speeds, and can be arranged in a particularly simple way if the component is pivotable about a joint running

transversely to the longitudinal axis of the automobile.

Arranging a joint for the component involves a high outlay in terms of construction, depending on the nature of the surface. Another embodiment of the invention, which is particularly advantageous for this purpose, therefore dispenses with a joint. Such an embodiment can be implemented particularly effectively, even in the case of highly convexly curved surfaces and difficult conditions of space, if the component can be moved out of the contour of the body element in parallel by means of the motor.

In addition to lightweight construction, it is of primary importance in modern automobile manufacturing, to cut back on additional structural elements. The drive of the washing arm can be achieved in a simple way if, according to another development of the invention, the motor for moving the washing arm can be driven by the washing fluid. This motor consists, for example, of a piston which has a connected push rod and which is moved slowly out of a position of rest as far as maximum deflection by the pressure of the washing fluid conveyed by means of a washing fluid pump. In this case, the speed of movement can be adapted, for example, by means of a throttle. It would also be possible, however, to drive the piston by means of a vacuum which is generated by the flow of washing fluid.

According to another advantageous development of the invention, the shield cleaning system has particularly low washing fluid consumption, along with a particularly high cleaning action, if it has a control device for conveying the washing fluid to the washing nozzles at the start and end of an intended time interval. By virtue of this design, dirt located on the shield is first softened and is subsequently flushed away.

Present-day automobiles have a shield cleaning system with a washing fluid pump for conveying washing

fluid to a front shield. The shield cleaning system according to the invention necessitates a particularly low outlay in terms of construction if the washing fluid pump is designed for selectively conveying washing fluid in two directions, the washing fluid being capable of being conveyed in one direction to the front shield and in the other direction to the shields of automobile lights. The front shield or the shields of the automobile lights can thereby be cleaned in succession.

The invention permits numerous embodiments. In order to make its basic principle even clearer, several of these are illustrated in the drawing and are described below. In the drawing:

Figure 1 shows a washing arm of a shield cleaning system according to the invention, together with adjacent components of an automobile,

Figure 2 shows the washing arm from Figure 1 in longitudinal section,

Figures 3a and 3b show a fluidic nozzle from Figure 2 in sectional illustrations, with flows depicted in them,

Figure 4 shows a circuit diagram of a shield cleaning system according to the invention,

Figure 5 shows a sectional illustration of another embodiment of a washing arm arranged in front of a shield of a headlamp,

Figure 6 shows the washing arm together with the shield from Figure 5, as seen from the front,

Figure 7 shows a shield cleaning system with a washing nozzle arranged on two yokes,

Figure 8 shows a sectional illustration of the shield cleaning system from Figure 7 along the line VIII-VIII,

Figure 9 shows a diagrammatic illustration of another embodiment of the shield cleaning system according to the invention,

Figure 10 shows a diagrammatic illustration of another embodiment of a shield cleaning system according to the invention.

Figure 1 shows a perspective illustration of a front left region of an automobile with a fender 1 and of two automobile lights 3, 4 arranged behind a common shield 2 and designed as front headlamps. The fender 1 has a recess 5 which is located directly below the shield 2 and in which a washing arm 6 for cleaning the shield 2 is mounted pivotably about a pivot axis 7. In the position depicted, the washing arm 6 is countersunk in the recess 5.

In order to clean the shield 2, the washing arm 6 is pivoted out of the recess 5 and over the shield 2. Figure 2 shows a sectional illustration of the washing arm 6, located above the shield 2, when the latter is being cleaned. It can be seen clearly that the washing arm 6 is of tubular design for receiving a washing fluid duct 8 and has a connection 9 for a washing fluid line 10. The washing fluid duct 8 has a taper which is continuous from the connection 9 of the washing fluid line 10. Arranged in the washing fluid duct 8 is a nonreturn valve 11 which prevents air from penetrating into the washing fluid line 10. Washing fluid passes through the washing fluid duct 8 to a plurality of washing nozzles 12-14 directed onto the shield 2. Furthermore, the washing fluid duct 8 has a resistance wire 15 in the region of the washing nozzles 12-14. The washing nozzles 12-14 are designed as so-called fluidic nozzles and generate a washing fluid jet oscillating laterally through an angle α . As a result, the washing nozzles 12-14 each have a striplike spray region, in each case two adjacent spray regions overlapping one another slightly. When the washing arm 6 pivots about the pivot axis 7 and the washing nozzles 12-14 spray at the same time, the washing fluid jet is guided over the entire shield 2.

One of the washing nozzles 12-14 from Figure 2, which are designed as fluidic nozzles, is illustrated

in section in Figures 3a and 3b. The washing nozzle 12 has an inlet duct 16, connected to the washing fluid duct 8 illustrated in Figure 2, and a funnel-shaped outlet 17. Arranged at the end of the inlet duct 16 is a nozzle 18 which focuses the washing fluid, flowing through the inlet duct 16 to a narrow main flow and feeds it to a swirl chamber 19. The flow-side end of the swirl chamber 19 is connected by means of two return ducts 20, 21 to the inlet region of the swirl chamber 19. The main flow first enters the swirl chamber 19 and generates a circulation flow there, with the result that the main flow is deflected toward one side. Washing fluid flows through the return duct 20, located opposite the circulation flow, into the inlet region of the swirl chamber 19 and forces the main flow to the other side. The washing fluid jet emerging from the outlet 17 thereby oscillates constantly through the angle α .

Figure 4 shows a circuit diagram of a shield cleaning system with a washing fluid pump 23 which is activated by a control device 22 and which is designed for selective conveying in both directions. A washing nozzle 24 for an automobile front shield, not illustrated, and a plurality of washing nozzles 25 provided for cleaning automobile light shields, not illustrated either, are connected to the washing fluid pump 23. Two washing fluid lines 26, 27 lead from the washing fluid pump 23 to a washing fluid container 28. Nonreturn valves 29-32 are arranged in each case upstream of the washing nozzles 24, 25 and in the washing fluid lines 26, 27 leading to the washing fluid container 28. For the sake of clarity, the directions of flow of the washing fluid are identified by arrows. Depending on the direction of rotation of the washing fluid pump 23, the washing fluid is conveyed selectively to the washing nozzle 24 of the front shield or to the washing nozzles 25 of the shields of the automobile lights.

Figure 5 shows a sectional illustration of an automobile light 35 arranged in a body panel 33 of an automobile and designed as a headlamp. The automobile light 35 has a convexly curved shield 34. The body panel 33 has a recess 36, through which a washing arm 37 of a shield cleaning system is led. Washing nozzles 38, which are located opposite and at a short distance from the shield 34, are arranged on the washing arm.

Figure 6 shows that the washing arm 37 is of T-shaped design and has a push rod 39 and, arranged transversely to the latter, a nozzle carrier 40 having a plurality of washing nozzles 38 illustrated in Figure 5. The push rod 39 has a bend corresponding to the convexity of the shield 34 and is mounted so as to be longitudinally displaceable in a guide 41. The push rod 39 is driven by an electric motor 42. The guide 41 of the push rod 39 consists of guiding elements 43 and is produced in one piece with a housing 44 of the automobile light 35. The nozzle carrier 40 has, on its side facing away from the shield 34, a cover 45 which is provided for closing the recess 36 of the body panel 33 when the shield washing system is in a basic position.

Figure 7 illustrates a shield cleaning system with a washing arm 48 having two yokes 46, 47 arranged parallel to one another. The yokes 46, 47 are in each case mounted pivotably on two opposite sides of a shield 49 and are driven, for example, electromotively. A washing nozzle 50 is arranged in the middle of the washing arm 48. The left half of one of the yokes 46 is of tubular design and has a connection 51 for a washing fluid line 52. The washing nozzle 50 is thereby supplied with washing fluid.

Figure 8 shows that the washing nozzle 50 changes its distance from the shield 49 during its movement. This distance is greatest when the washing nozzle 50 is in a middle position above the shield 49, and decreases above the edge regions of the shield 49. The washing nozzle 50 is designed as a fluidic nozzle

illustrated in Figures 3a and 3b. Furthermore, the washing nozzle 50 is mounted pivotably relative to the yokes 46, 47. The washing fluid is thereby sprayed perpendicularly onto the shield 49 by the washing nozzle 50 in any position. The washing nozzle 50 may, of course, also be inclined slightly in the direction of movement, so that dirt adhering to the shield 49 is flushed away in one direction.

Figure 9 illustrates a shield cleaning system with a washing nozzle 54 arranged on a washing arm 53. The washing arm 53 is mounted pivotably in a lateral region of a shield 55 and has a yoke 56 partially surrounding the shield 55. The washing nozzle 54 is likewise designed as a fluidic nozzle illustrated in Figures 3a and 3b and is arranged with a slight inclination transverse to its direction of movement. A spray region adapted to the shape of the shield 55 is thereby generated during the movement of the washing nozzle 54. The washing arm 53 can be pivoted through an angular range of 90° by an electric motor, which is not illustrated.

Figure 10 shows a sectional illustration of a body element 58 (fender) designed as a fender, with an adjacent automobile light 59. In this embodiment, the washing arm provided is a component 60 which is designed as a flap and which can be pivoted about a joint 62 by means of a motor 61. The component has, on its top side, a washing nozzle 63 with a washing fluid line 64 connected to the latter. The washing jet from the washing nozzle 63 can be steered by means of the movement of the component 60 from a lower position, in which the jet is directed onto the lower edge of a shield 65 of the automobile light 59, into an upper position, in which the jet is directed onto the upper edge of the shield 65 of the automobile light 59.

It is not shown that, even when the nozzle 63 is spraying, the component 60, instead of being swung up, can move parallel to itself out of the contour of the body element 58 designed as a fender.

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Patent Claims

1. A shield cleaning system, operating solely by spraying with washing fluid, for shields of an automobile, in particular for shields of automobile lights, with a washing arm movable over and at a distance from the shield by a motor and with a washing nozzle which is arranged on the washing arm and which is provided for spraying washing fluid onto the shield, wherein the washing nozzle (12-14, 25, 38, 50, 54, 63) is designed for spraying a part region of the shield (2, 34, 49, 55, 65) and can be moved by the washing arm (6, 37, 48, 53) over that region of the shield (2, 34, 49, 55, 65) which is to be cleaned.
2. The shield cleaning system as claimed in claim 1, wherein the washing nozzle (12-14, 25, 38, 50, 54, 63) is designed as a fluidic nozzle with a washing fluid jet oscillating essentially transversely to the direction of movement of the washing arm (6, 37, 48, 53).
3. The shield cleaning system as claimed in claim 1 or 2, wherein the washing arm (6) is of tubular design for receiving a washing fluid duct (8) leading to a plurality of washing nozzles (12-14) and has a connection (9) for a washing fluid line (10).
4. The shield cleaning system as claimed in claim 3, wherein the washing fluid duct (8) has a tapering inner contour, as seen from the connection (9) of the washing fluid line (10).
5. The shield cleaning system as claimed in at least one of the preceding claims, wherein a nonreturn valve (11) is arranged in the washing fluid duct (8).
6. The shield cleaning system as claimed in at least one of the preceding claims, wherein a heating

element (resistance wire 15) is arranged in the washing fluid duct (8) and/or at the washing nozzles (12-14).

7. The shield cleaning system as claimed in at least one of the preceding claims, wherein the washing arm (6) is mounted pivotably about a pivot axis (7).

8. The shield cleaning system as claimed in at least one of the preceding claims, wherein there are means (yokes 46, 47, 56) for adjusting the distance of the washing nozzle (50, 54) from the shield (49, 55) during the movement of the washing nozzle (50, 54).

9. The shield cleaning system as claimed in at least one of the preceding claims, wherein the washing arm (48, 53) has a yoke (46, 47, 56) mounted pivotably in a lateral region of the shield (49, 55) and at least partially surrounding the shield (49, 55) in the basic position.

10. The shield cleaning system as claimed in at least one of the preceding claims, wherein the washing arm (48) has a yoke (46, 47) mounted on two opposite sides of the shield (49).

11. The shield cleaning system as claimed in at least one of the preceding claims, wherein the washing arm (48) has two yokes (46, 47) running parallel and the washing nozzle (50) is mounted pivotably relative to each of the yokes (46, 47).

12. The shield cleaning system as claimed in at least one of the preceding claims, wherein the washing nozzle (54) is inclined transversely to its direction of movement.

13. The shield cleaning system as claimed in at least one of the preceding claims, wherein the washing arm (37) has a push rod (39) mounted so as to be longitudinally displaceable and shaped according to the contour of the shield (34).

14. The shield cleaning system as claimed in at least one of the preceding claims, wherein, in a basic position, the washing nozzles (12-14, 38) are countersunk in a recess (5, 36) of an automobile

component (fender 1, body panel 33) adjacent to the shield (2, 34).

15. The shield cleaning system as claimed in claim 14, wherein the washing arm (37) has a cover (45) closing the recess (36) in the basic position.

16. The shield cleaning system as claimed in at least one of the preceding claims, wherein the washing arm (6, 37, 48, 53) is produced from plastic by the injection molding method.

10 17. The shield cleaning system as claimed in at least one of the preceding claims, wherein a guide (41) of the push rod (39) or a mounting of the washing arm is produced in one piece with a housing (44) of the automobile light (35).

15 18. The shield cleaning system as claimed in at least one of the preceding claims, wherein the washing arm is designed as a component (60) shaped according to the contour of a body element (58) and is arranged so as to be movable out of said body element.

20 19. The shield cleaning system as claimed in claim 18, wherein the body element (58) is a fender of an automobile.

20. The shield cleaning system as claimed in claim 18, wherein the washing nozzle (63) is arranged on the top side of the component (60).

21. The shield cleaning system as claimed in claim 18, wherein the washing nozzle (63) is arranged on the underside of the component (60).

22. The shield cleaning system as claimed in claim 30 18, wherein the component (60) is designed as a washing nozzle (63).

23. The shield cleaning system as claimed in claim 18, wherein the component (60) is pivotable about a joint (62) running transversely to the longitudinal axis of the automobile.

24. The shield cleaning system as claimed in claim 18, wherein the component (60) is arranged so as to be movable out of the contour of the body element (58) in parallel by means of the motor (61).

24. The shield cleaning system as claimed in at least one of the preceding claims, wherein the motor (61) for moving the washing arm (6, 37, 48, 53, component 60) is a motor (61) driven by the washing fluid.

25. The shield cleaning system as claimed in at least one of the preceding claims, wherein there is a control device (22) for conveying the washing fluid to the washing nozzles (24, 25) at the start and end of an intended time interval.

26. The shield cleaning system as claimed in at least one of the preceding claims, with a washing fluid pump for conveying washing fluid to a front shield of the automobile, wherein the washing fluid pump (23) is designed for selectively conveying washing fluid in two directions, the washing fluid being capable of being conveyed in one direction to the front shield and in the other direction to the shields (2, 34, 61) of automobile lights (3, 4, 35, 63).

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Abstract

Shield cleaning system, operating solely by spraying
with washing fluid

A shield cleaning system, operating solely by spraying with washing fluid, for shields (2) of an automobile light has a plurality of washing nozzles (12-14) which are arranged on a washing arm (6) pivotable about a pivot axis (7) and which are located opposite and at a short distance from the shield (2) and together spray a part region of the shield (2) with washing fluid. The washing nozzles (12-14) are guided by the washing arm (6) over that region of the shield (2) which is to be cleaned.

(Figure 2)

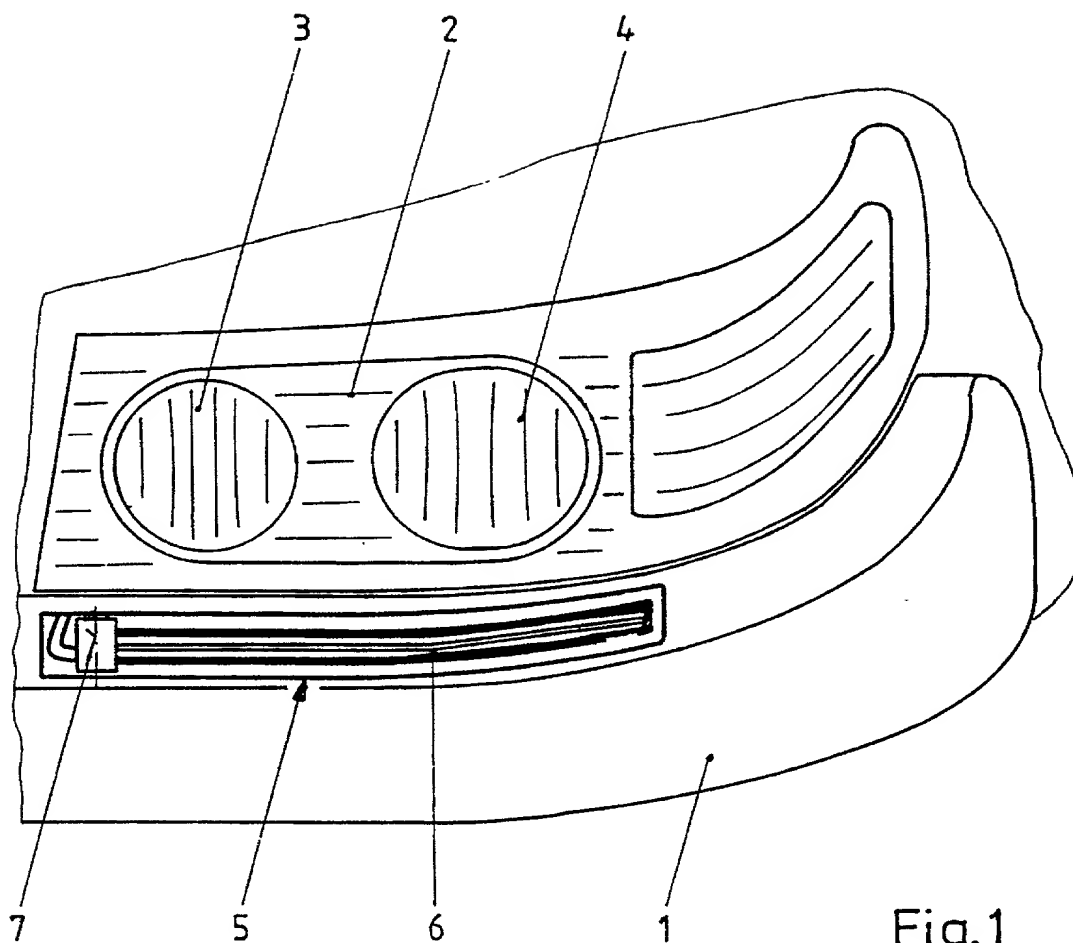


Fig. 1

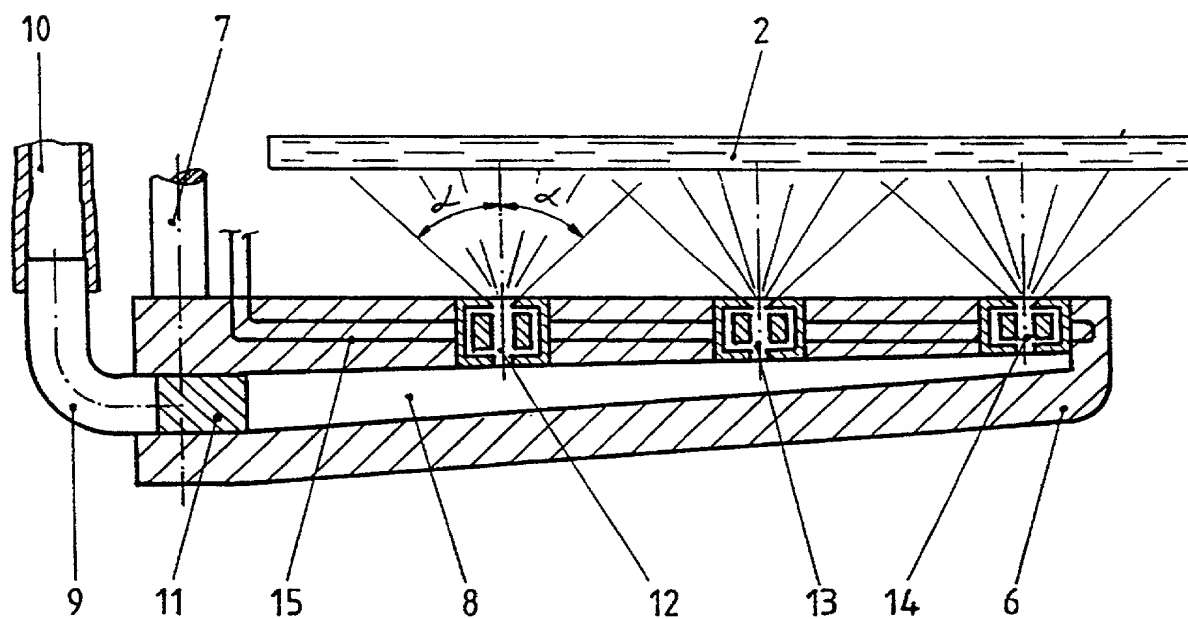


Fig. 2

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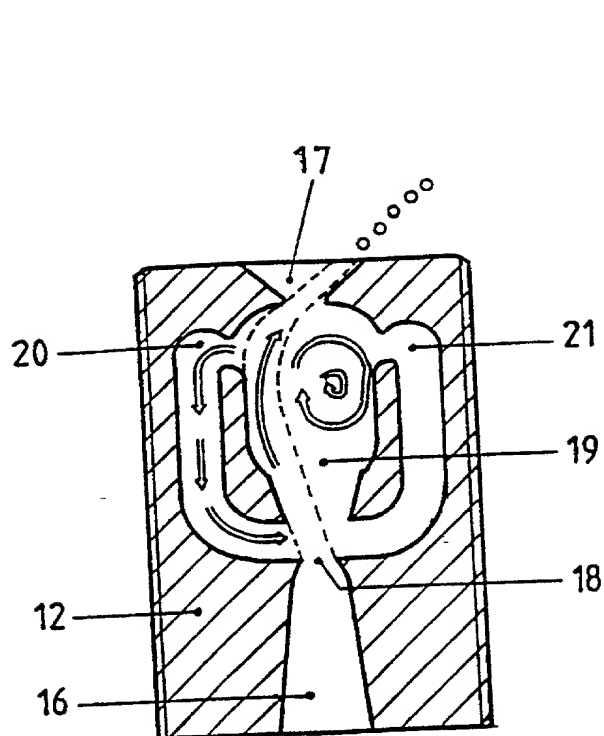


Fig. 3a

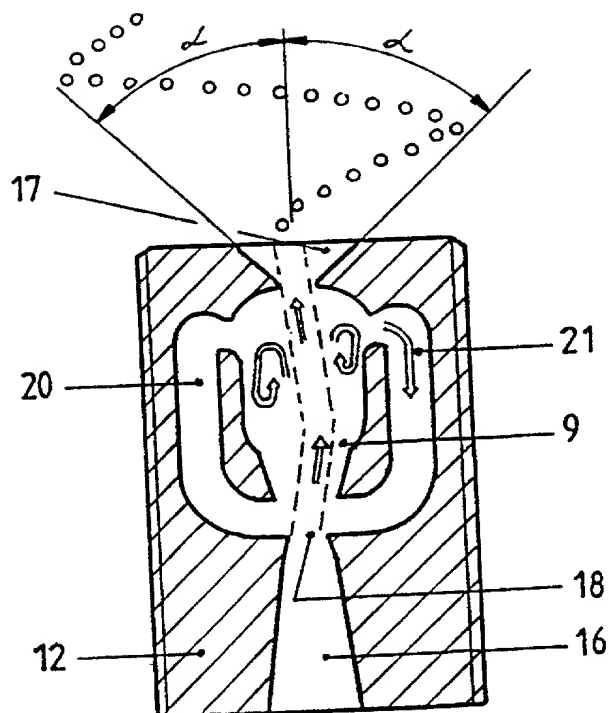


Fig. 3b

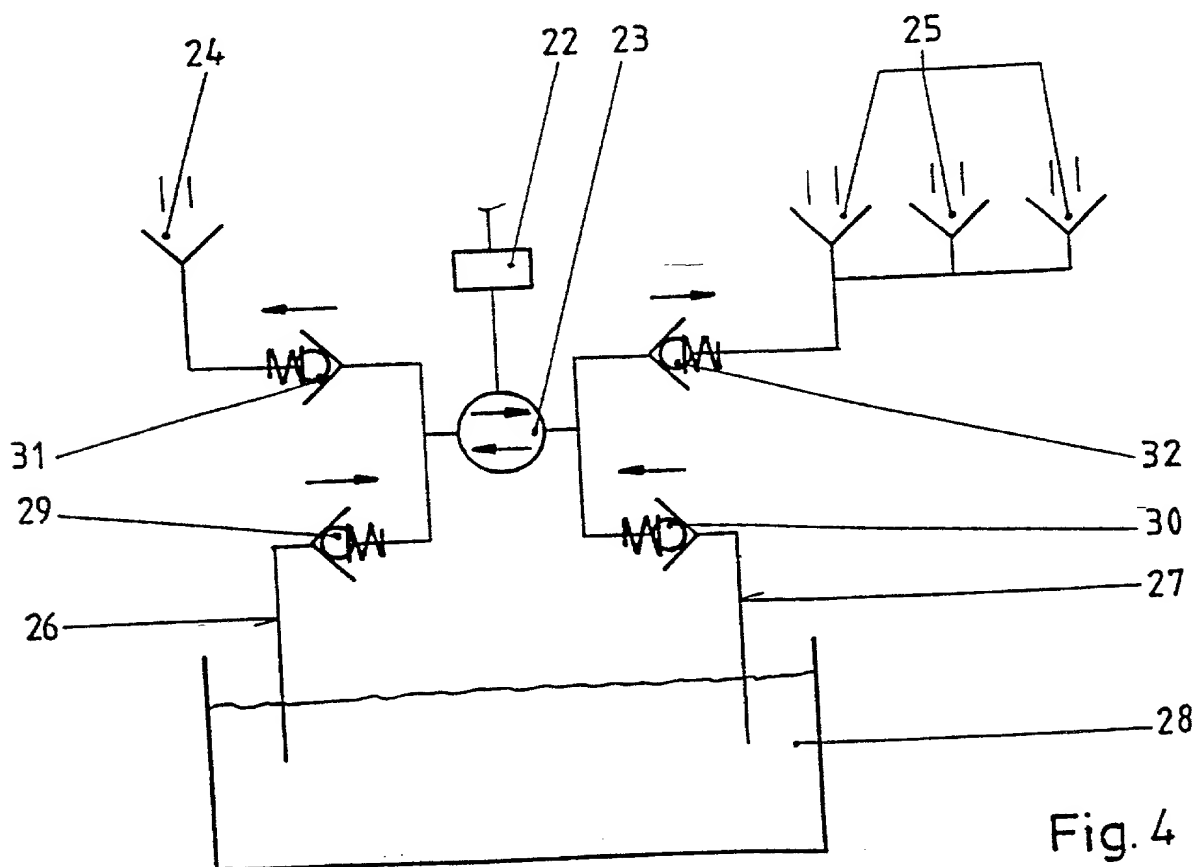


Fig. 4

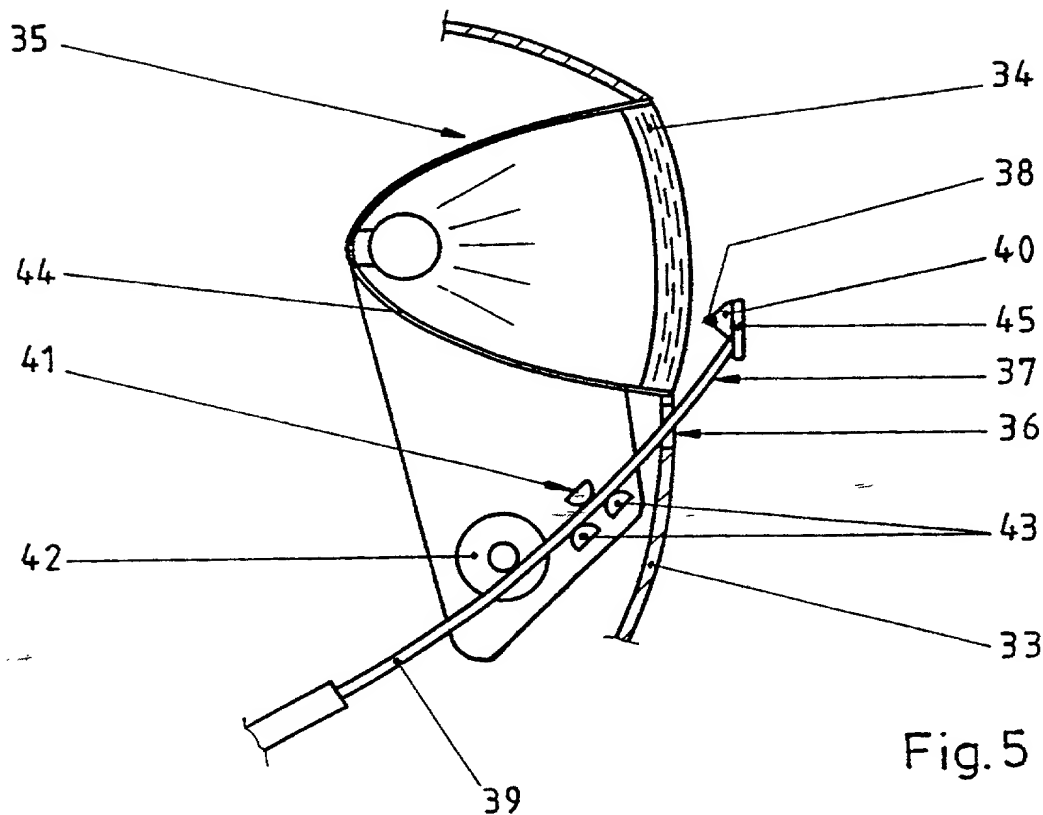


Fig. 5

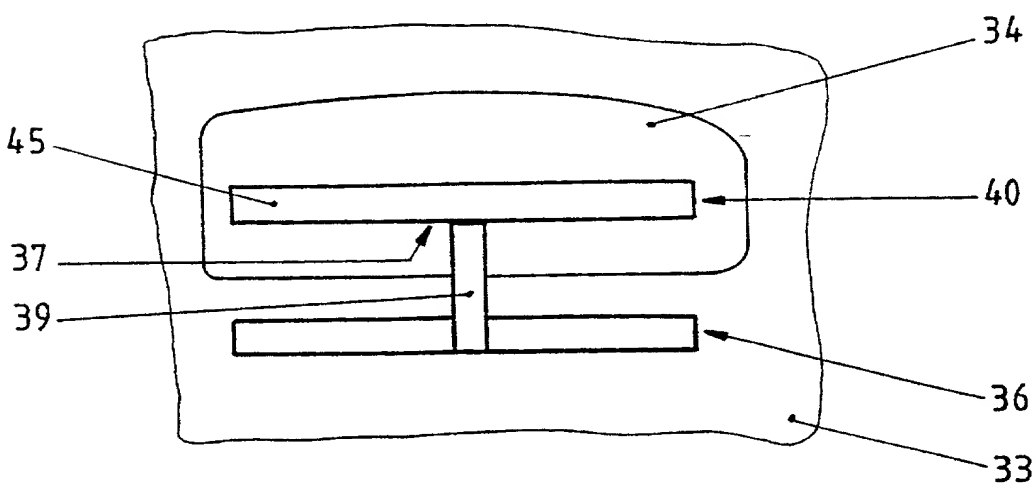
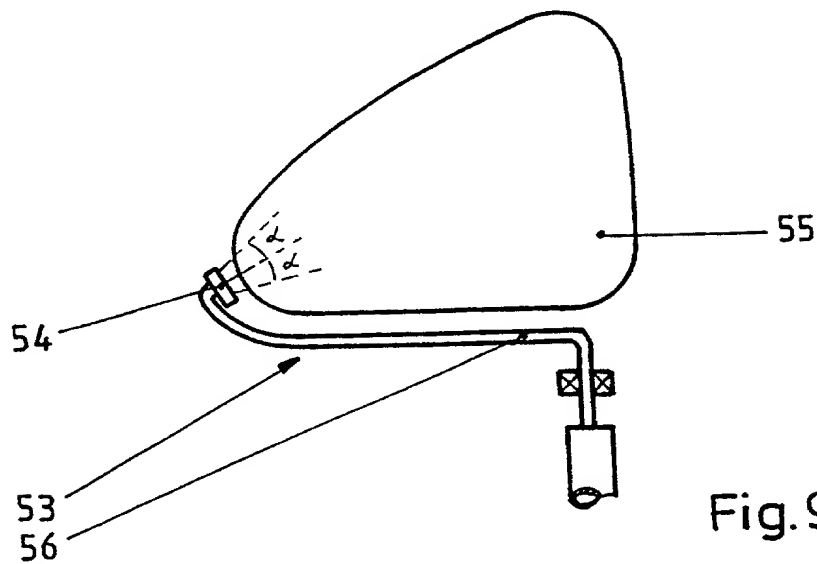
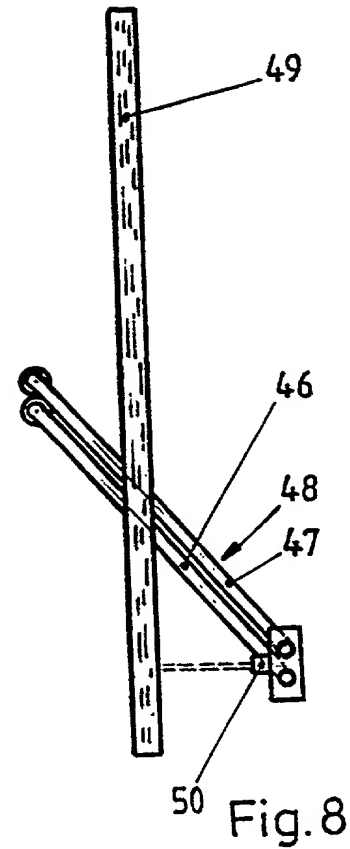
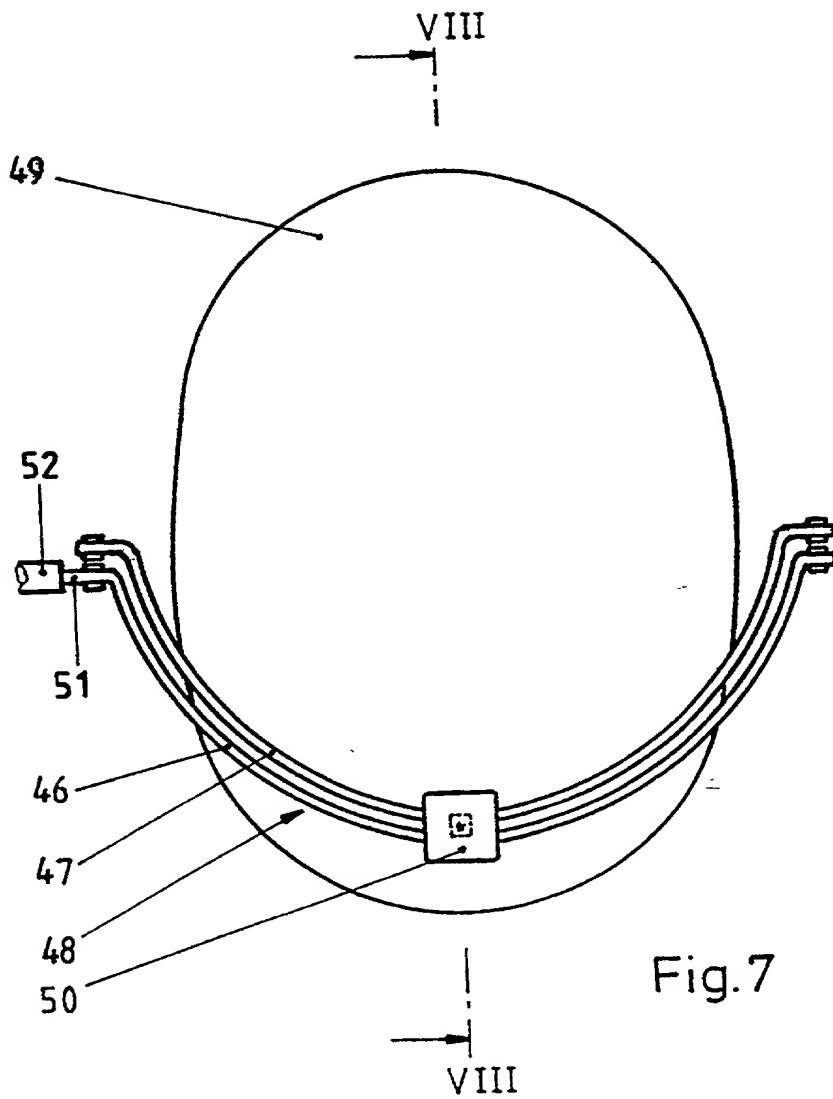


Fig. 6

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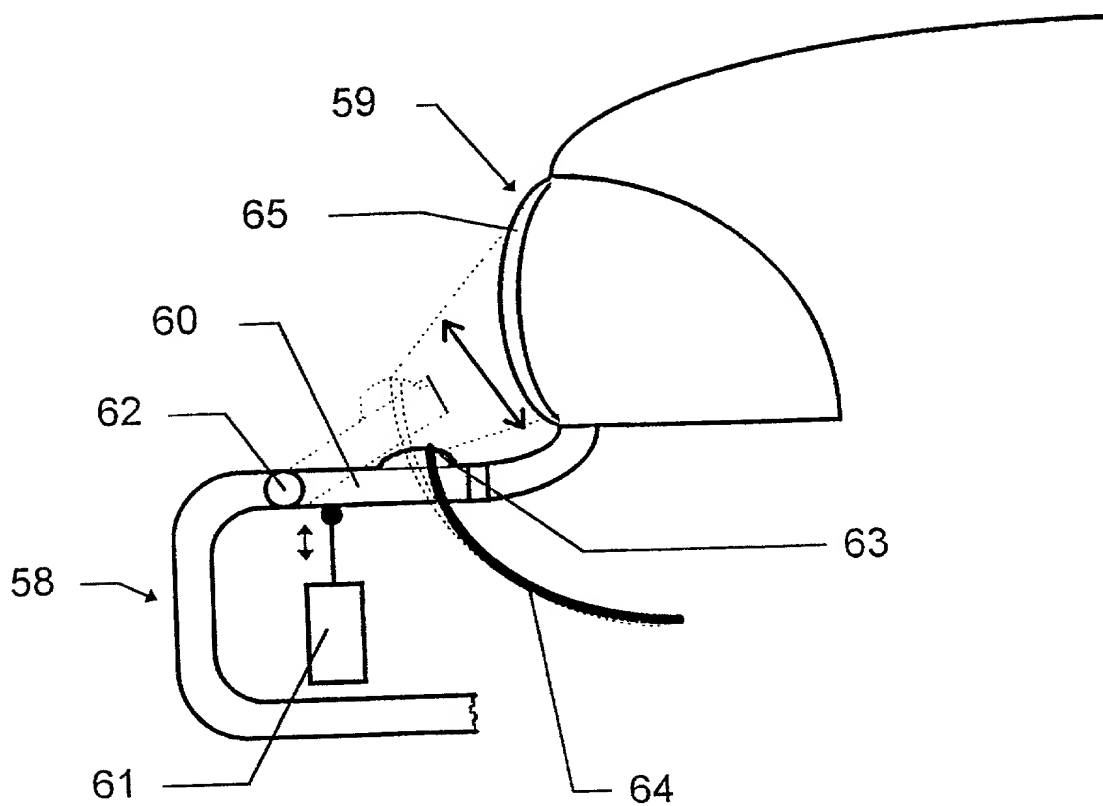


Fig. 10

COMBINED DECLARATION FOR PATENT APPLICATION AND POWER OF ATTORNEY

(Includes Reference to PCT International Applications)

ATTORNEY'S DOCKET NUMBER

3446 US

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

Shield cleaning system, operating solely by spraying
with washing fluid

the specification of which (check only one item below):

☐ is attached hereto.☐ was filed as United States application

Serial No. _____

on _____

and was amended

on _____ (if applicable).

☒ was filed as PCT international applicationNumber PCT/EP97/05478on October 6, 1997

and was amended under PCT Article 19

on _____ (if applicable).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, §1.56(a).

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate or of any PCT international application(s) designating at least one country other than the United States of America listed below and have also identified below any foreign application(s) for patent or inventor's certificate or any PCT international application(s) designating at least one country other than the United States of America filed by me on the same subject matter having a filing date before that of the application(s) of which priority is claimed:

PRIOR FOREIGN/PCT APPLICATION(S) AND ANY PRIORITY CLAIMS UNDER 35 U.S.C. 119:

COUNTRY of PCT application PCT 1	APPLICATION NUMBER	DATE OF FILING (day, month, year)	PRIORITY CLAIMED UNDER 35 USC 119
Germany	196 46 972.4	14/11/1996	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO
			<input type="checkbox"/> YES <input type="checkbox"/> NO
			<input type="checkbox"/> YES <input type="checkbox"/> NO
			<input type="checkbox"/> YES <input type="checkbox"/> NO
			<input type="checkbox"/> YES <input type="checkbox"/> NO

Combined Declaration For Patent Application and Power of Attorney (Continued)

(Includes Reference to PCT International Applications)

ATTORNEY'S DOCKET NUMBER

3446 US

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) or PCT international application(s) designating the United States of America that is/are listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in that/those prior application(s) in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1.56(a) which occurred between the filing date of the prior application(s) and the national or PCT international filing date of this application:

PRIOR U.S. APPLICATIONS OR PCT INTERNATIONAL APPLICATIONS DESIGNATING THE U.S. FOR BENEFIT UNDER 35 U.S.C. 120:

U.S. APPLICATIONS		STATUS (Check one)		
U.S. APPLICATION NUMBER	U.S. FILING DATE	PATENTED	PENDING	ABANDONED
PCT APPLICATIONS DESIGNATING THE U.S.				
PCT APPLICATION NO.	PCT FILING DATE	U.S. SERIAL NUMBERS ASSIGNED (if any)		

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith. (List name and registration number)

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	POST OFFICE ADDRESS	POST OFFICE ADDRESS	CITY	STATE & ZIP CODE/COUNTRY
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	POST OFFICE ADDRESS	POST OFFICE ADDRESS	CITY	STATE & ZIP CODE/COUNTRY
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	POST OFFICE ADDRESS	POST OFFICE ADDRESS	CITY	STATE & ZIP CODE/COUNTRY

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

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DATE

22.4.99

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